

GSFC

# LDAS-Morocco project

## Drought monitoring in Morocco

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# CONTENTS

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- **Generalities**
- **Objectives**
- **Principal activities / Methodology**
  - Moroccan capacity strengthening
  - Calculate of drought indicators
  - Drought EW bulletins edition
  - Products dissemination
- **Expertise**
- **Expected results and documents to be produced**
- **Main users**
- **Planning**

# Generalities

- Generalities

- Objectives

- Principal activities / Methodology

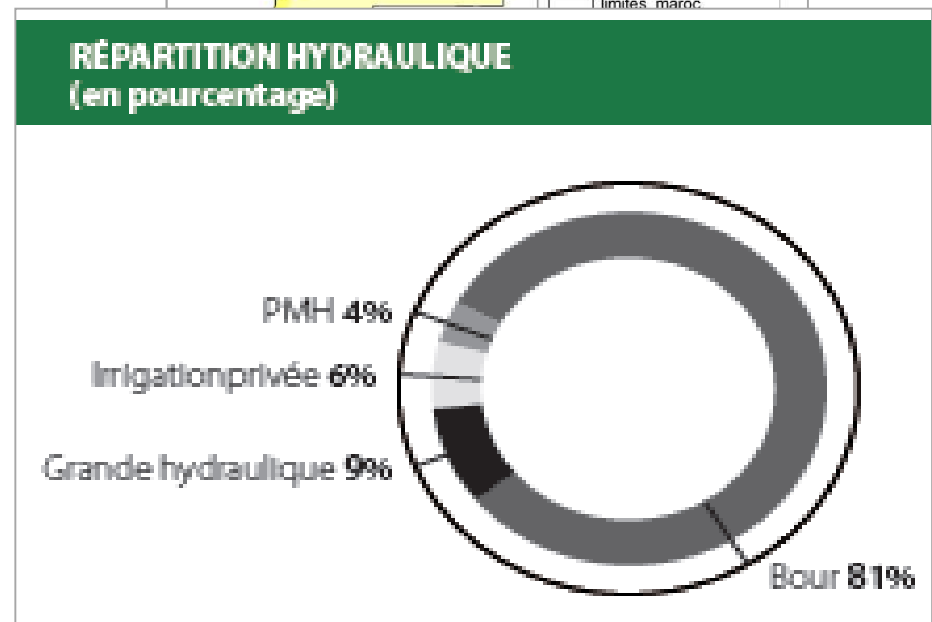
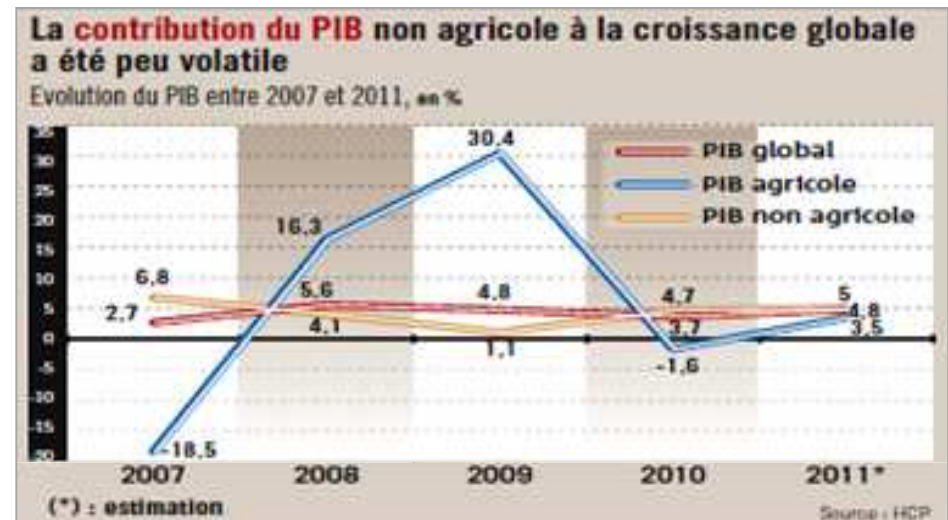
- Expertise

- Expected results & documents to produce

- Main users

- Planning

- Importance of Agriculture in GDP;
- Low annual precipitation level and strong inter and intra annual variability;
- Dominance of non irrigated agriculture (>80% SAU) ;
- Drought vulnerability has negative impacts on other sectors ;





## Natural resources degradation in Morocco

Deforestation : **31.000 ha/year**

Degradation of rangelands : **8 M ha**

Overgrazing exceeding **23%** of the capacity of natural rangelands

Salinity : **37.000 ha** of irrigated areas

Erosion by water : **2/3** of agricultural areas exposed

# Geographic and climate context in Morocco



In Morocco, rain is the most important parameter in the climate (preoccupant for human activities),



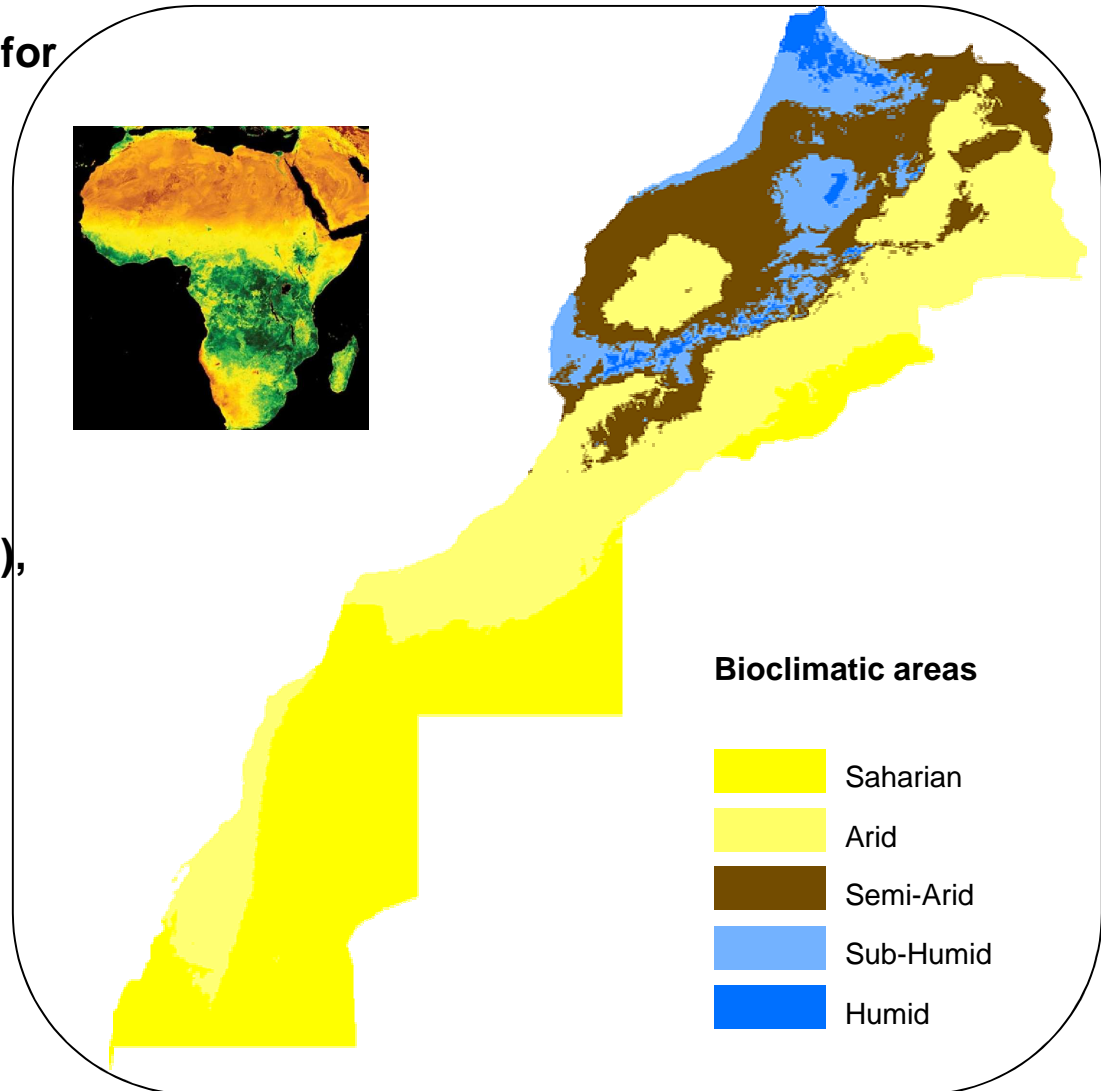
- low quantities
- concentrated in few days,
- temporal irregularity (seasons, years),
- unequally distributed in space.



## Floods



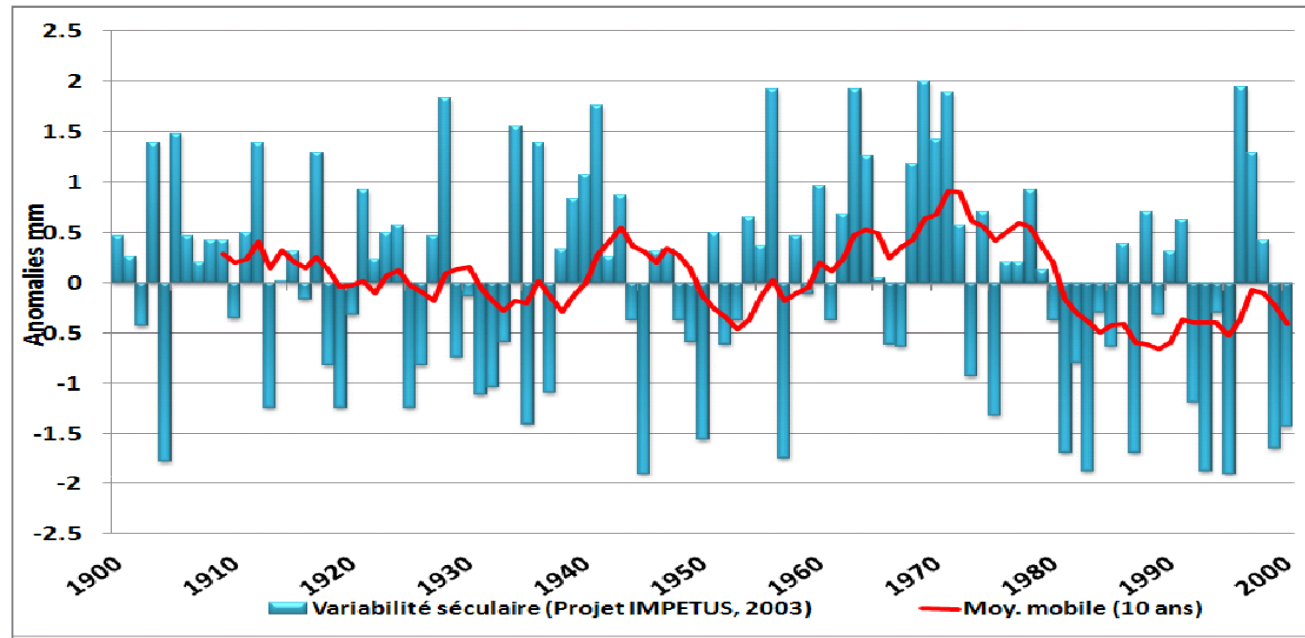
## Drought





# Drought in Morocco

- Generalities
- Objectives
- Principal activities / Methodology
- Expertise
- Expected results & documents to produce
- Main users
- Planning



Annual variability of precipitations in Morocco (DMN)

- 1900-2000: > 10 periods of drought.
- Frequency : 1 year/5 before 1990 & 1 year/2 1990-2000.
- Duration between 2 droughts < 13 years. At least 1 dry year / decade.

# Generalities

- Generalities
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## Problematic

- There is no operational drought EW system in Morocco;
- The approaches are dominated by reactive measures;
- Limited coordination of information coming from different sources (departments in charge of water management, departments in charge of agriculture, meteorology ...).

## Needs :

- Earlier drought detection (different parameters and data)
- EW system allowing gathering and dissemination of information about drought.

# Objective

- Generalities
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Elaboration of a drought early warning system based on environmental indicators. This is to enhance drought detection and to provide required information in order to anticipate drought effects.

## Specifically:

- Capacity strengthening of Moroccan team in the field of drought EW.
- Development of methodology based on the calculate, analysis and diffusion of drought indicators at national and local scale.
- Edition & diffusion of drought EW bulletins.



# Principal activities



- Generalities
- Objectives
- Principal activities / Methodology
- Expertise
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## 1- Moroccan capacity strengthening

- Training sessions
- Knowledge transfer and Expertise
- workshops & national/international meetings

### Needed training:

- Training on drought early warning methodologies
- Training on surface modeling and techniques of data assimilation
- Use and integration of LIS outputs (precipitations, ET, and soil moisture mainly) for drought EW

### Needed expertise:

- Implementation of a Drought monitoring methodology ;
- Adaptation and validation of calculated indicators for each agro-climatic zone in Morocco and definition of specific drought EW classes to each zone. (national expertise)

# Principal activities



- Generalities
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- [Principal activities / Methodology](#)
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## 1- Moroccan capacity strengthening

- Training sessions
- Knowledge transfer and Expertise
- workshops & national/international meetings

## 2- Calculate of drought indicators

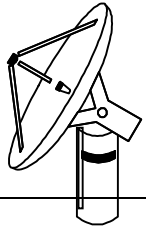
Drought EW system : Methodology

## 3- Edition & diffusion of drought EW bulletins

- Monthly from October to April each year
- Each 10 days in the most sensitive period for vegetation growth

## 4- Products Dissemination

- LIS dissemination platform
- Other information dissemination systems
- Brochures, papers, ..

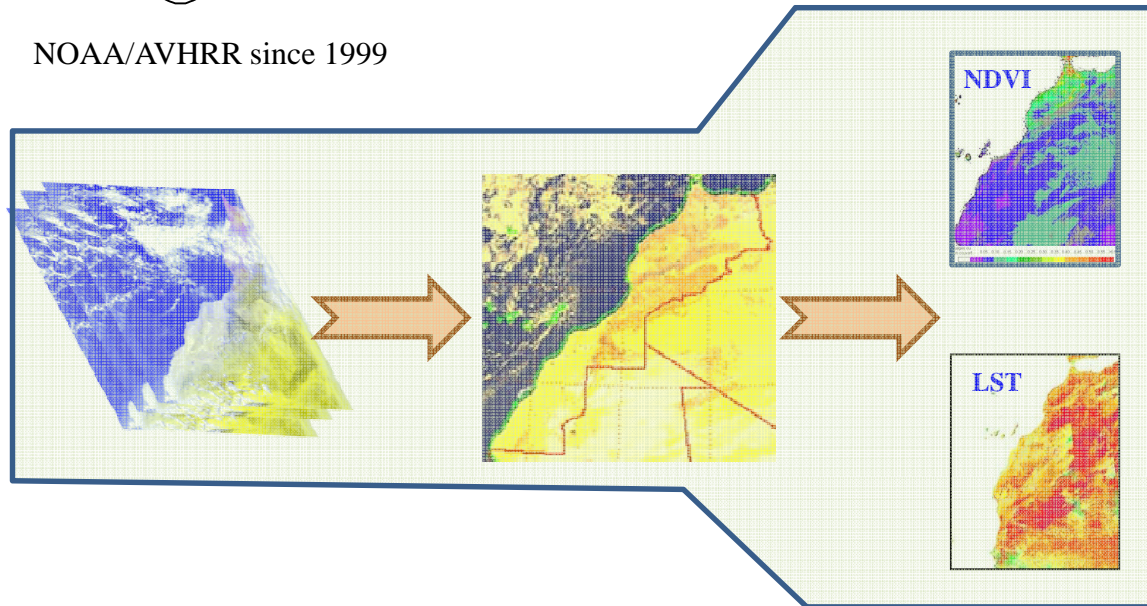


# Previous methodology

## Drought monitoring



NOAA/AVHRR since 1999



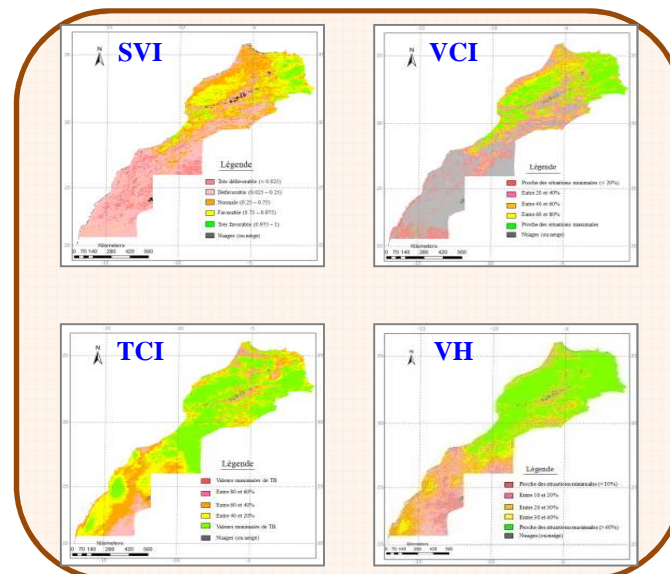
NDVI	January			February			March					
	d1	d2	d3	d1	d2	d3	d1	d2				
1999												
2000												
2001												
2002												
2003												
2004												
2005												
2006												
2007												
2008												
2009												
2010												
2011												
2012												
2013												

$$SVI = NDVI - m / Sd$$

$$VCI = (NDVI - NDVI_{min}) / (NDVI_{max} - NDVI_{min})$$

$$TCI = (ST - Stmin) / (STmax - Stmin)$$

$$VH = 0.5VCI + 0.5TCI$$



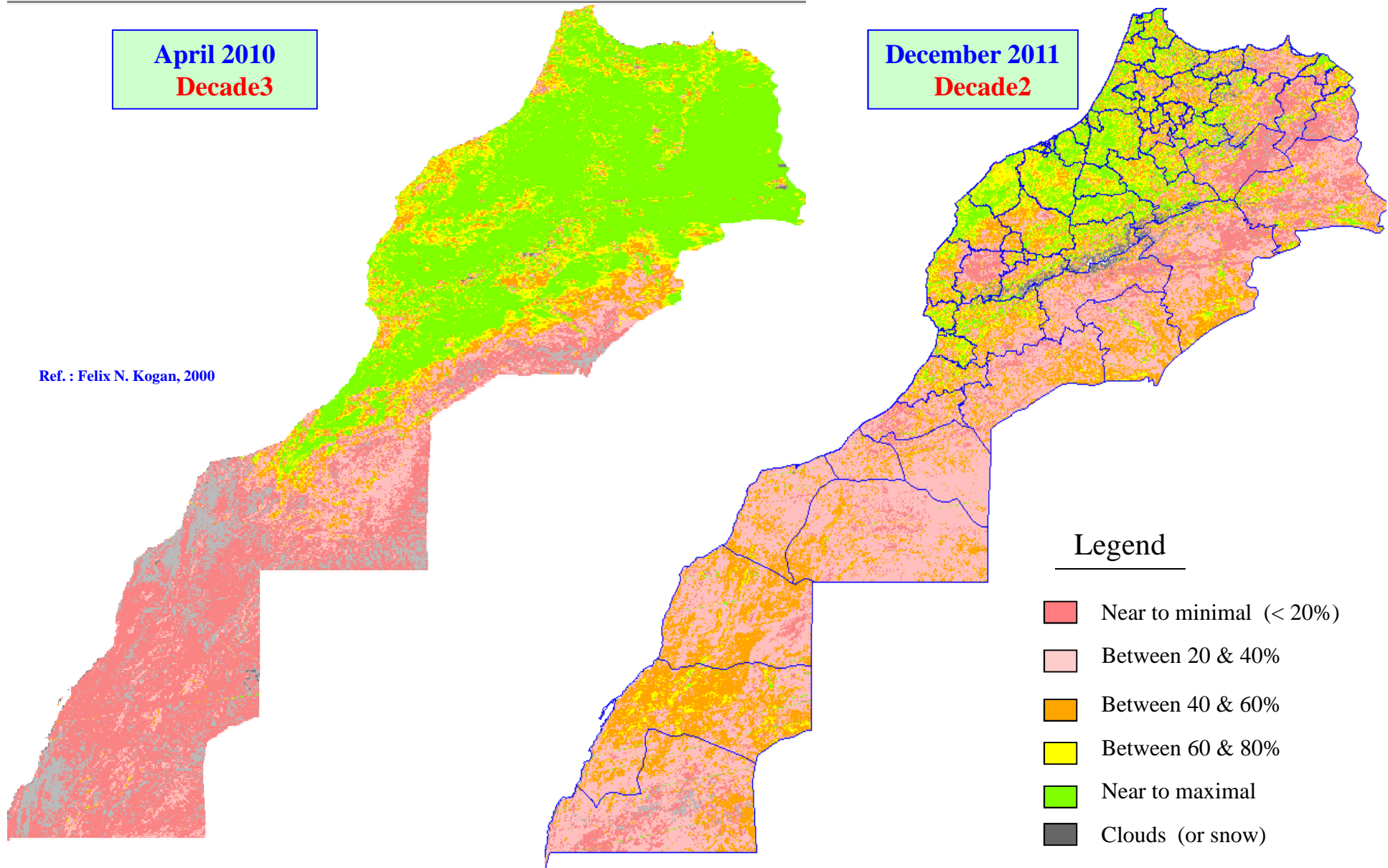
# Example of Indicators (VCI)



April 2010  
Decade3

December 2011  
Decade2

Ref. : Felix N. Kogan, 2000

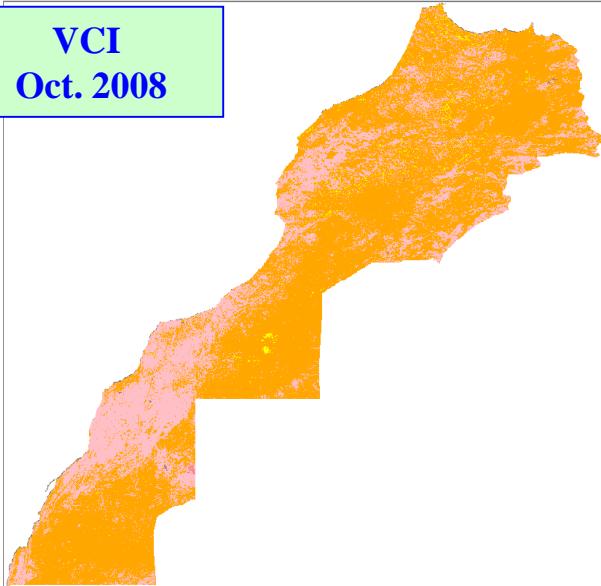




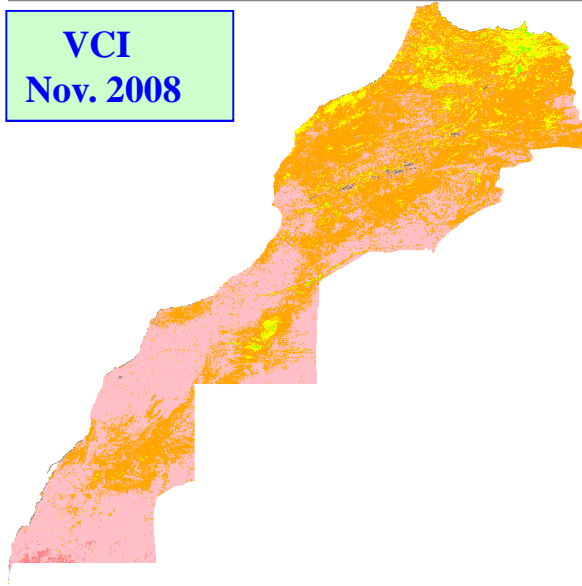
# Vegetation Condition Index



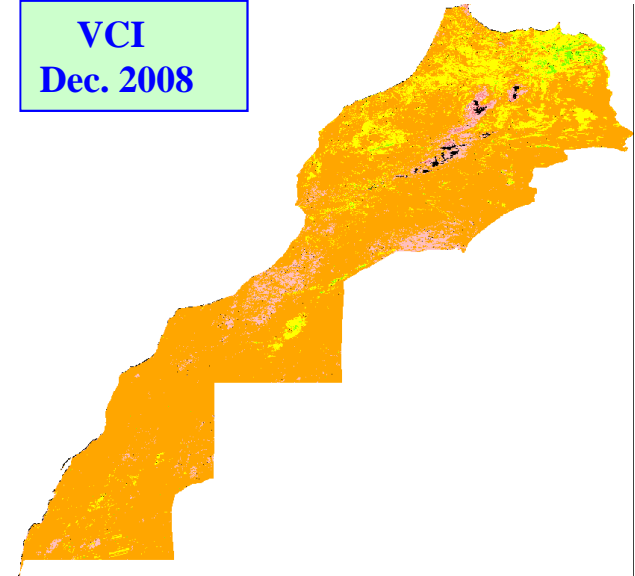
VCI  
Oct. 2008



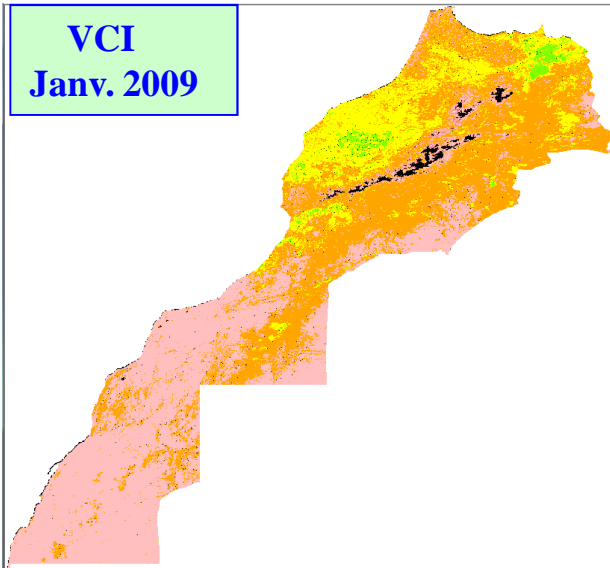
VCI  
Nov. 2008



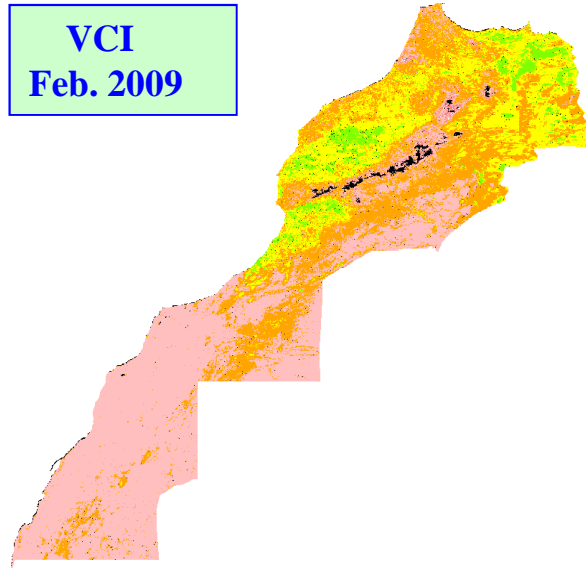
VCI  
Dec. 2008



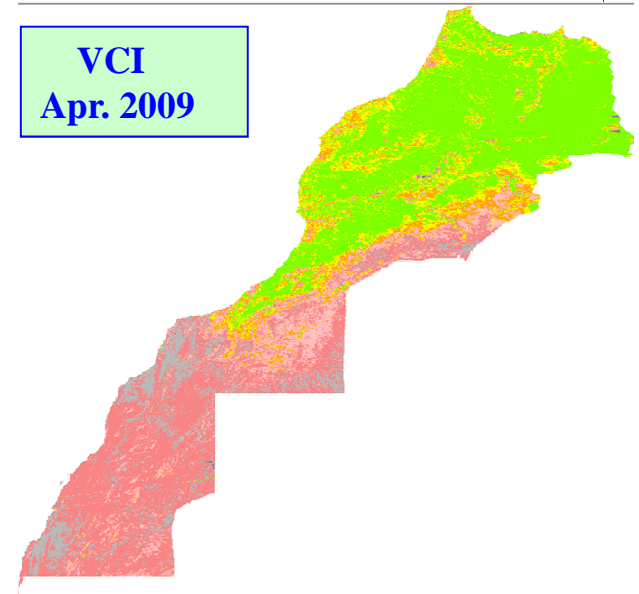
VCI  
Janv. 2009



VCI  
Feb. 2009

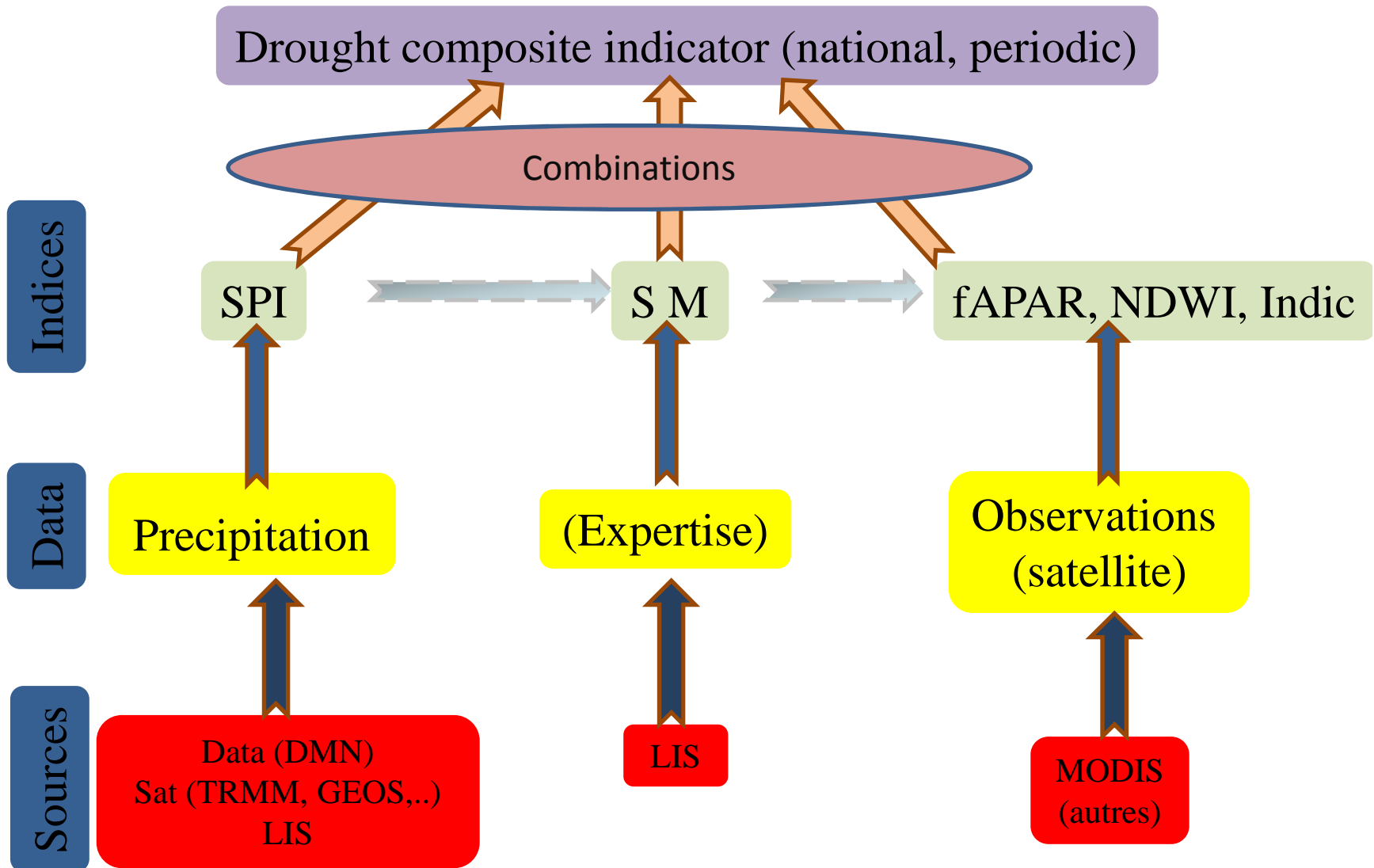


VCI  
Apr. 2009



# Methodology

- Generalities
- Objectives
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- Expertise
- Expected results & documents to produce
- Main users
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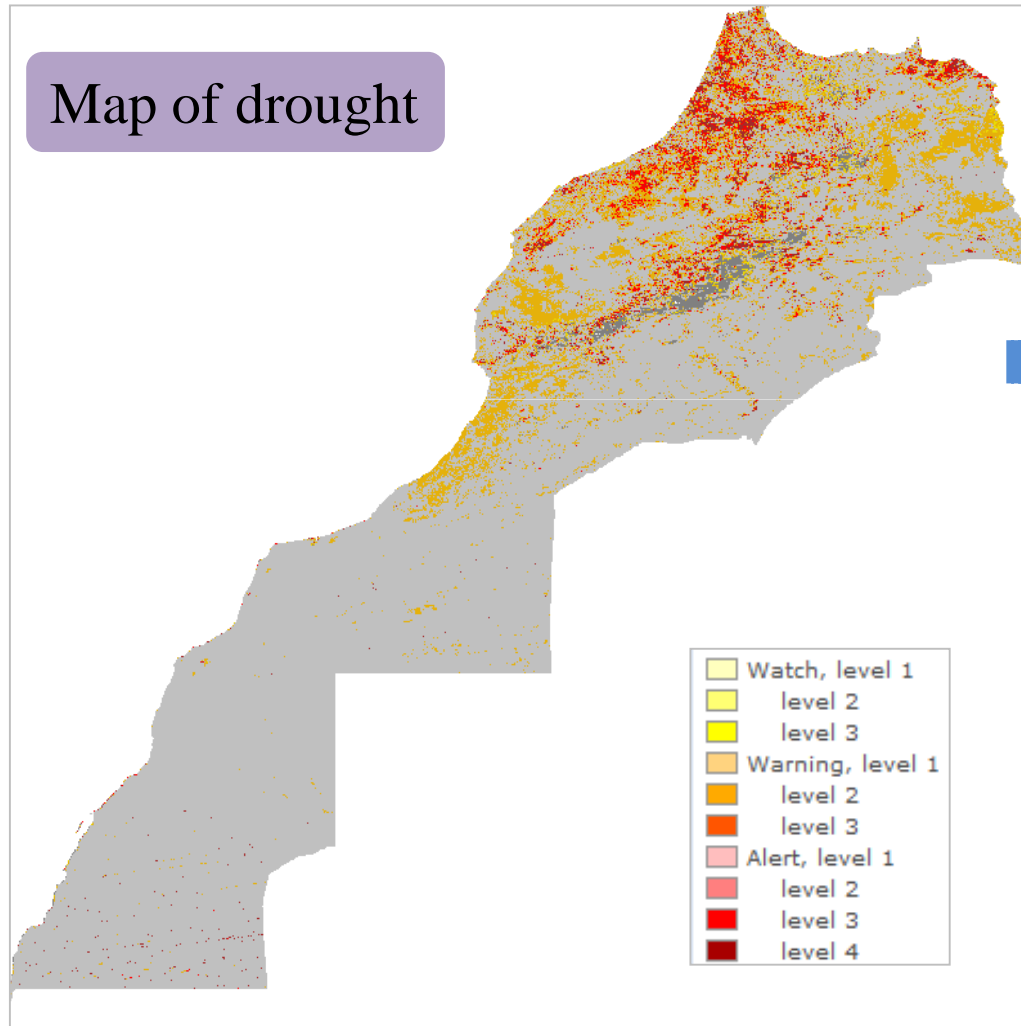




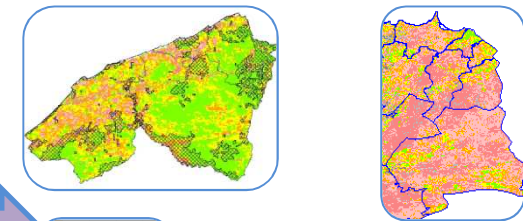
# Methodology

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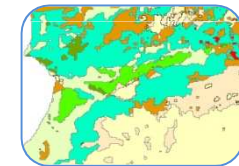
## Map of drought



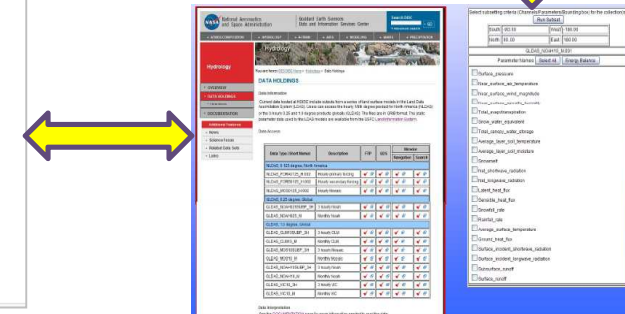
## Validations (locale)

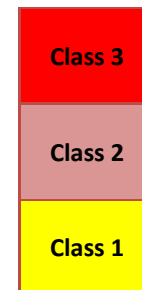
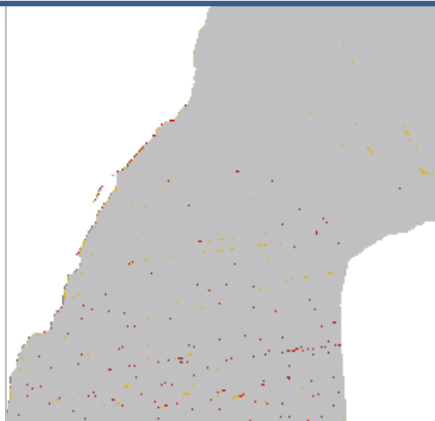
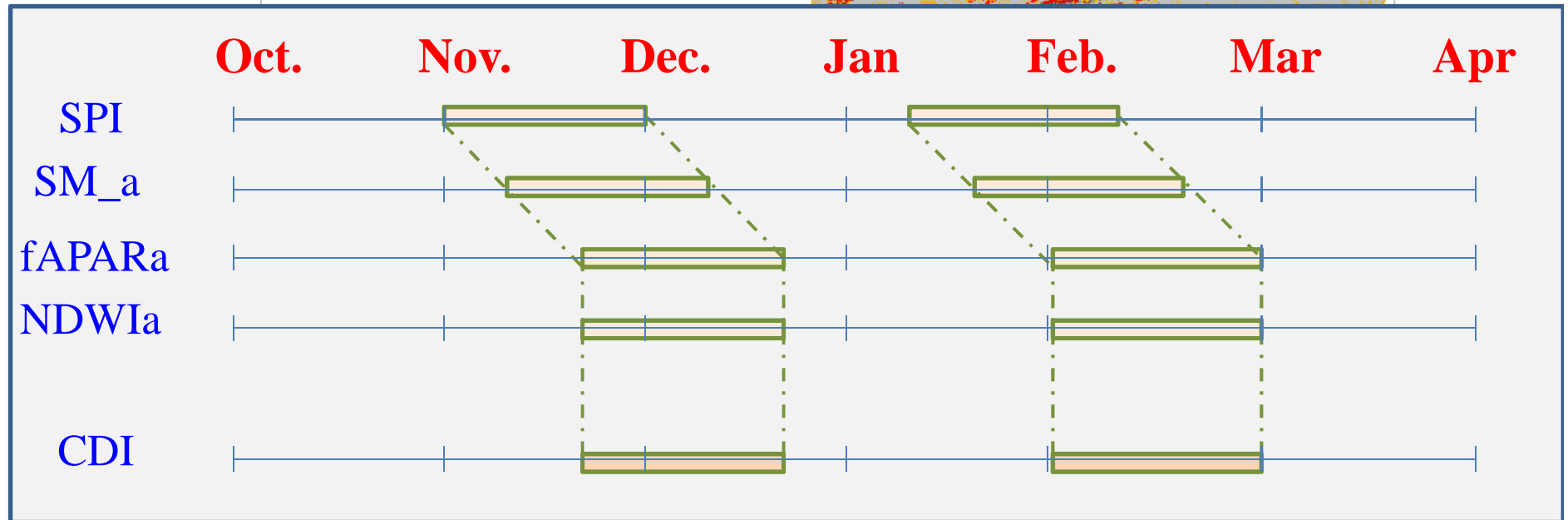
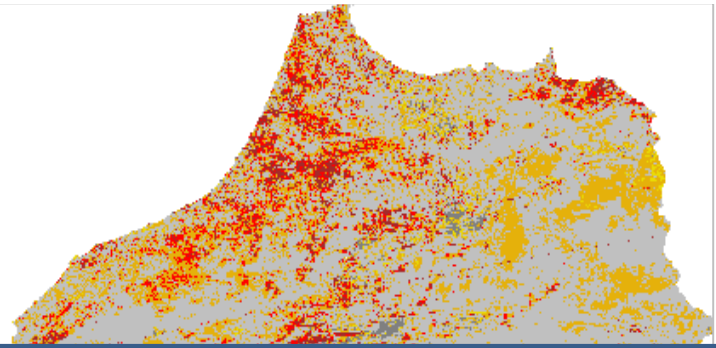


Code	Nom	Superficie (ha)	Superficie (km²)
1	Alger	1500	0,015
2	Bordj	2500	0,025
3	Oran	3000	0,030
4	Constantine	4000	0,040
5	Sétif	5000	0,050
6	Annaba	6000	0,060
7	Batna	7000	0,070
8	Boumerdes	8000	0,080
9	Blida	9000	0,090
10	Bouhar	10000	0,100
11	Bordj	11000	0,110
12	Boumerdes	12000	0,120
13	Batna	13000	0,130
14	Bouhar	14000	0,140
15	Boumerdes	15000	0,150
16	Bouhar	16000	0,160
17	Boumerdes	17000	0,170
18	Bouhar	18000	0,180
19	Boumerdes	19000	0,190
20	Bouhar	20000	0,200
21	Boumerdes	21000	0,210
22	Bouhar	22000	0,220
23	Boumerdes	23000	0,230
24	Bouhar	24000	0,240
25	Boumerdes	25000	0,250
26	Bouhar	26000	0,260
27	Boumerdes	27000	0,270
28	Bouhar	28000	0,280
29	Boumerdes	29000	0,290
30	Bouhar	30000	0,300



LIS







# Expertise

- Generalities
- Objectives
- Principal activities / Methodology
- Expertise
- Expected results & documents to produce
- Main users
- Planning

## Principal steps:

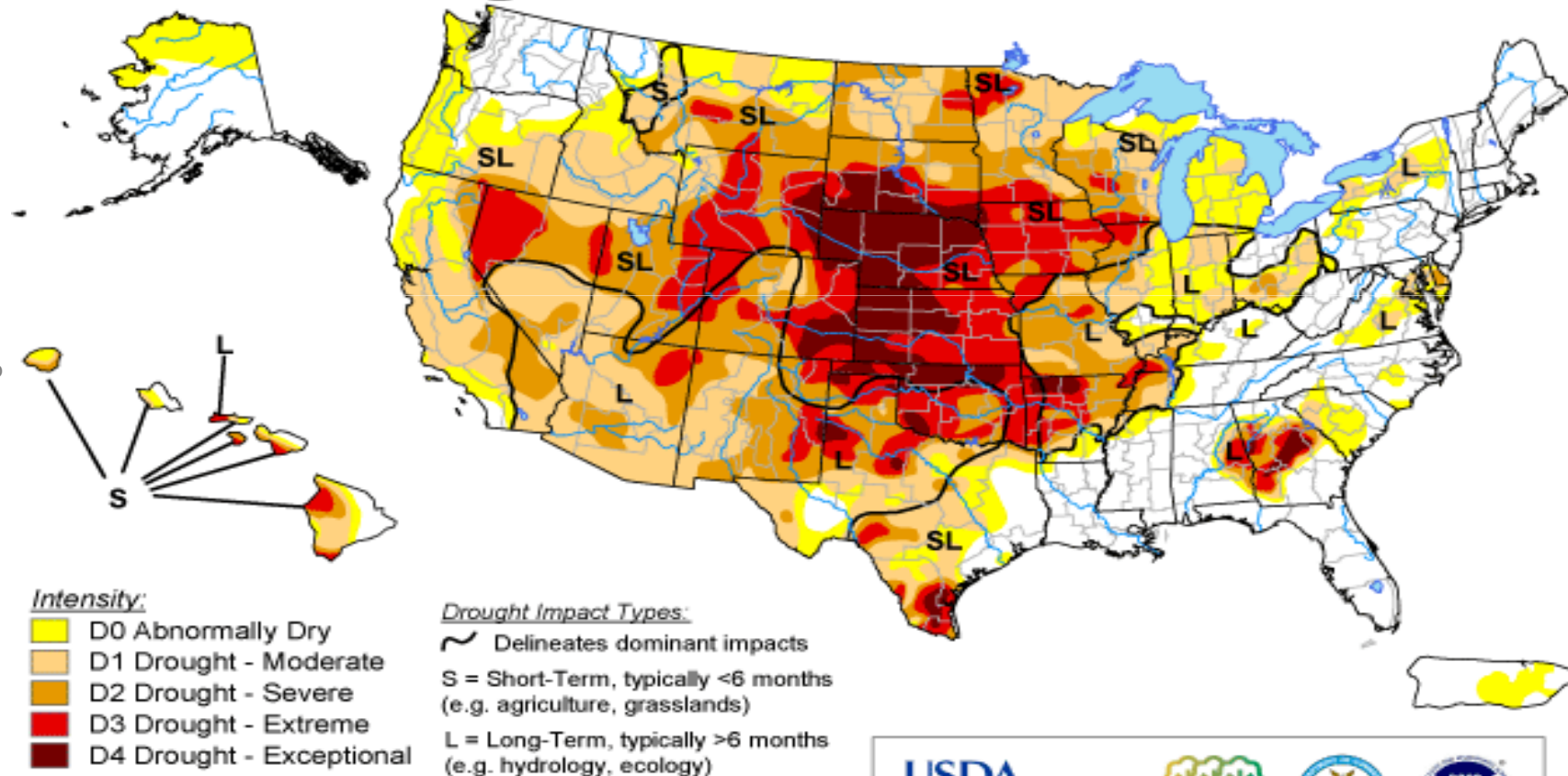
- ToR prepared since April 2013 (NO WB August 13)
- AMI published on July 13 (national NP & CRTS website)
- AMI published on Sept 13 (UNDB, dg\_Market, WB external website)
- Direct contacts with international institutions
- October 8<sup>th</sup>: comity meeting (NDMC)
- October 23 : NO WB
- Contacts started with NDMC (Mark Svoboda) since October 24.

# International expertise

- Generalities
- Objectives
- Principal activities / Methodology
- Expertise
- Expected results & documents to produce
- Main users
- Planning

## U.S. Drought Monitor

October 9, 2012  
Valid 7 a.m. EDT



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://droughtmonitor.unl.edu/>



Released Thursday, October 11, 2012  
Author: Matthew Rosencrans, NOAA/NWS/NCEP/CPC

# Expected results and documents to be produced

- Generalities
- Objectives
- Principal activities / Methodology
- Expertise
- Expected results & documents to produce
- Main users
- Planning

## Expected results:

- Capacities strengthened (training & expertise)
- Models implemented (operational)
- Methodology developed

## Documents to produce:

- Maps of SPI
- Maps of SM (& anomalies) at national scale
- Maps of fAPAR at national scale
- Maps of NDWI at national scale
- Maps of DCI
- Bulletins (drought monitoring)
- Reports

# Main users



- Ministry of Agriculture and Rural Development : the principal user.
- Regional departments mainly in pilot areas for field data gathering and results validation (INRA, regional department of Agriculture, Universities,...).
- Companies of agricultural insurances.
- The Department in charge of Water and Forests.

# Planning

[illegible]



# CONCLUSION

- Generalities

In Morocco, drought is

- Objectives

- **frequent** phenomenon,

- Principal

activities /

- it concerns **a large areas**,

Methodology

- **complex** phenomenon and result from interaction between several parameters. And,

- Expertise

it is very difficult to study & monitor this phenomenon without a **global observation** of the affected areas.

- Expected

results &

documents to

produce

With LIS plate-form, we hope

- Main users

- **Enhancement & accuracy of drought indicators**

- Planning

- **Operational drought EW System**

- **Results are disseminated to users and efficiently used by decision makers.**

**Thank you for your attention**